

FADEC Fire Test Forum

FADEC Fire Test FORUM



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*This session is intended to
be a forum.*

Purposes of the forum format:

- Provide an open discussion among the participants as well as with the presenter.
- Define an forum agenda (time management)
- Look at AC 33.17-1 by Paraphrasing

Maybe have a little fun!

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Some Questions Received

*Here's the question & here's our answer to what we think you asked.
It's a forum, let's talk.*

Why

To prevent the certification of an uninstallable engine

When

When the article may be placed where it is susceptible

Fire Zones

Are not defined in the engine codes (FAR 33)

but are defined in the airplane codes (FAR xx.1181)

Flammable Fluid Zones

No direct reference in the FAR's

They are zones with flammable fluids but no ignition source

Relationship to Explosion Proof Test

They demonstrate different things, BUT...

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Fire vs. Explosion Proof Tests

- Designated Fire Zone
 - Fire Test Required
 - Explosion Proof Test Required
 - Environment II, Category E Equipment Test
 - Easier test, not cause explosion
- Flammable Fluid Zone
 - No Fire Test Required
 - Explosion Proof Test Required
 - Environment I, Category A Equipment Test
 - Tougher test, contain explosion

CORRECTION
from conference
handout

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FADEC Fire Test

Do we need to?



Do we want to tackle this and propose a change?

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From AC 33.17-1

5. General

c. Fire Test Pass/Fail Criteria: In general, the following fire test criteria have been applied to the **test article** and found to be acceptable:

(3) No support of an existing fire event by the **constituent material** of the article being tested or by flammable fluid leaking from the test article (e.g., **rapid self-extinguishing and no re-ignition after test flame removal**).

Consideration must be given to **fires that continue to burn after removal of test flame**. This type of event could be either combustion of the constituent material of the test article or combustion of flammable fluid leaking from the component (firewalls are not considered in either case). In general, these events should continue to be cause for failure of the test, unless it can be shown that the residual fire will not significantly increase the overall fire hazard. The acceptability of such a test result will be determined on a case by case basis, and will consider the type and function of the component under test.

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Circuit boards

Short??

'Continue'

So it requires a conclusion!

Can you do it?

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Current Concern

- In a number of recent fire tests of FADECs it has been difficult to judge if it was a pass or a fail.
 - A burn-through occurs and a flame remains following removal of the test flame.
 - Not a real surprise on each point.
- Significant dialogue has been the result.
- Question is:
 - Are the words in AC33.17-1 good enough to enable you to make the determination "pass or fail" ?



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What is the Pass / Fail criteria?

Reference paragraph 5 (c)

Where's the heartburn?

- Maintain the ability to perform those functions intended to be provided in the case of fire.
- Must not cause a hazardous condition while continuing to operate, but must allow or may cause a safe shutdown of the engine at any time within the required exposure time period.
- A safe engine shutdown at any time during the fire resistant test is an acceptable outcome for this type of component, provided the safe shutdown is maintained until the end of the 5 minutes fire resistant test.
- No support of an existing fire event by the constituent material of the article being tested or by flammable fluid leaking from the test article
- Consideration must be given to fires that continue to burn after removal of the test flame.
- In general, these events should continue to be cause for failure of the test, unless it can be shown that the residual fire will not significantly increase the overall fire hazard.
- At no time during or at the end of the test should a hazardous condition result.



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What happens if there is a burn through?

8. OTHER CONSIDERATIONS.(a).4.(e)

- Acceptable evidence that the fire is contained would be that the firewall component does not develop a burn through hole. **N/A**

FADEC burn through:

- Affects on FADEC operation 
- Exposes burnable innards 
- Potential for case material supporting combustion 
- Potential for mount failure 

Seems to focus on continued combustion or support of the fire.

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What if the unit continues to burn after the flame is removed?

5. General (c)(3)

- No support of an existing fire event by the constituent material of the article being tested or by flammable fluid leaking from the test article. Consideration must be given to fires that continue to burn after removal of the test flame. This type of event could be either combustion of the constituent material of the test article or combustion of flammable fluid leaking from the component (firewalls are not considered in either case).
- In general, these events should continue to be cause for failure of the test, unless it can be shown that the residual fire will not significantly increase the overall fire hazard. The acceptability of such a test result will be determined on a case by case basis, and will consider the type and function of the component under test.

Seems to be solvable within the existing AC

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Short discussion on other components

- Any discussion on other components?
- Let's talk